

February 4, 2009

**TECHNICAL SUPPORT DOCUMENT FOR
ETHANOL FACILITIES: PROPOSED RULE FOR
MANDATORY REPORTING OF GREENHOUSE
GASES**

Climate Change Division
Office of Atmospheric Programs
U.S. Environmental Protection Agency

February 4, 2009

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1. Industry Description

Ethanol is produced primarily for use as a fuel component, but is also used in industrial applications and in the manufacture of beverage alcohol. Ethanol can be produced from the fermentation of sugar, starch, grain, and cellulosic biomass feedstocks, or produced synthetically from ethylene or hydrogen and carbon monoxide. There are approximately 140 ethanol refineries in the United States and its territories.

The sources of GHG emissions at ethanol production facilities considered in the analysis for the proposed rule are stationary combustion, onsite landfills, and onsite wastewater treatment.

Stationary combustion at ethanol facilities usually includes the combustion of either natural gas or coal in boilers. Many wet milling facilities use co-generation.

Data is unavailable on landfilling at ethanol facilities, but it is believed that some of these facilities may have landfills with significant GHG emissions.

The wastewater generated at ethanol production facilities is handled in a variety of ways, with dry milling and wet milling facilities generally treating wastewaters differently.

2. Total Emissions

In 2006, CH₄ emissions from wastewater treatment at ethanol production facilities were 68,200 mtCO₂e, less than 1% of total CH₄ emissions.

Estimates of total national emissions from landfills and stationary combustion at ethanol facilities are unavailable.

3. Review of Existing Programs and Methodologies

For information on the review of existing programs and methodologies, please refer to the Technical Support Documents for general stationary fuel combustion (EPA-HQ-OAR-2008-004), landfills (EPA-HQ-OAR-2008-034), and wastewater treatment (EPA-HQ-OAR-2008-035).

4. Types of Emissions Information to be Reported

For information on information to be reported, please refer to the Technical Support Documents for general stationary fuel combustion (EPA-HQ-OAR-2008-004), landfills (EPA-HQ-OAR-2008-034), and wastewater treatment (EPA-HQ-OAR-2008-035).

5. Options for Reporting Threshold

5.1 Source Emissions-based thresholds

In evaluating thresholds for ethanol facilities, we first considered emissions-based thresholds of CH₄ generation (“generation threshold”) and CH₄ emissions (“emissions threshold”) at wastewater treatment systems of 1,000 mtCO₂e, 10,000 mtCO₂e, 25,000 mtCO₂e, and 100,000 mtCO₂e per year. Data on emissions from landfills at ethanol refineries were unavailable to conduct similar analyses for this source. The “generation threshold” is the amount of CH₄ that would be emitted from the facility if no CH₄ recovery takes place. This includes all CH₄ generation from all wastewater treatment system types at ethanol facilities, including digesters. The “emissions threshold” includes the CH₄ that is emitted to the atmosphere from these systems. In the emissions threshold, CH₄ that is recovered and combusted at digesters is taken into account and deducted from the total CH₄ generation calculated. Please see the Technical Support Document for Wastewater (EPA-HQ-OAR-2008-035) for more information.

Table 1. Summary of Threshold Analysis for Industrial Wastewater Treatment at Ethanol Refineries

Threshold (mtCO ₂ e)*	# Systems	% Systems	Emissions (mtCO ₂ e)	% Emissions
Ethanol –Emissions Threshold				
1,000	11	7.9	67,041	64
10,000	2	1.4	50,810	48
25,000	1	0.7	32,850	31
100,000	0	0	0	0
Ethanol – Generation Threshold				
1,000	78	56	385,805	94
10,000	3	2.2	213,715	52
25,000	2	1.4	178,050	44
100,000	1	0.7	127,570	31

* Threshold analyzed is based on wastewater treatment emissions only.

A readily available dataset from the Renewable Fuels Association (RFA 2006) containing production for all ethanol plants in operation as of July 2006 was used to estimate emissions. This dataset distinguished between dry and wet milling plants; however, it did not include plant-specific information on wastewater generation rates, influent BOD or COD levels, or treatment processes on site. Therefore, default values from the U.S. Inventory were used to calculate CH₄ emissions.

For wet milling operations, it was assumed that all mills had anaerobic secondary treatment in place in order to calculate plant-level emissions. The number of mills that would meet each threshold was then counted. However, only 33% of mills are expected to actually have anaerobic treatment onsite. Therefore, the plant counts in each threshold were multiplied by 33% to estimate the number of plants believed to exceed the threshold. Only two wet milling operations are expected to meet a threshold. To estimate the total emissions for plants exceeding the threshold, the average emission rate

for plants in each threshold was estimated and multiplied this average by the total number of plants expected to have anaerobic treatment on site.

To be conservative, for dry milling operations, it was assumed that all mills had anaerobic treatment in place and none operated a biomethanator. In keeping with the U.S. Inventory estimation methodology, we assumed 25% of emissions from the systems were emitted, and 75% were recovered. Even with these conservative assumptions, it was found that there were no dry milling operations that meet any of the thresholds under consideration.

The number of operations that have generation above the generation thresholds was estimated. This estimation assumed there was no biogas recovery in place. For wet milling operations, it was estimated that four plants would exceed the 1,000 tCO₂e threshold, three plants would exceed the 10,000 tCO₂e threshold, two plants would exceed the 25,000 tCO₂e threshold, and one plant would exceed the 100,000 tCO₂e threshold. Seventy-five dry milling operations are expected to exceed the 1,000 tCO₂e threshold.

5.2 Other threshold options

EPA also considered a facility-level threshold for ethanol refineries. A limited data set on stationary combustion at ethanol refineries and emission factors from IPCC and the GHG Inventory was used to estimate the minimum number of facilities that would meet each of the facility-level thresholds examined (Graboski 2002). Data were unavailable to estimate emissions from landfills at ethanol refineries, or to estimate the combined wastewater treatment and stationary combustion emissions at facilities.

Table 2 Threshold Analysis for Ethanol Production

Threshold Level	National Emissions mtCO ₂ e	Total Number of Facilities	Emissions Covered		Facilities Covered	
			mtCO ₂ e /year	Percent	Number	Percent
1,000 mtCO ₂ e	Not estimated	140	Not estimated	Not estimated	>101	>72%
10,000 mtCO ₂ e	Not estimated	140	Not estimated	Not estimated	>94	>67%
25,000 mtCO ₂ e	Not estimated	140	Not estimated	Not estimated	>86	>61%
100,000 mtCO ₂ e	Not estimated	140	Not estimated	Not estimated	>43	>31%

6. Options for Monitoring Methods

For information on monitoring methods, please refer to the Technical Support Documents for general stationary fuel combustion (EPA-HQ-OAR-2008-004), landfills (EPA-HQ-OAR-2008-034), and wastewater treatment (EPA-HQ-OAR-2008-035).

7. Options for Estimating Missing Data

For information on options for estimating missing data, please refer to the Technical Support Documents for general stationary fuel combustion (EPA-HQ-OAR-2008-004), landfills (EPA-HQ-OAR-2008-034), and wastewater treatment (EPA-HQ-OAR-2008-035).

8. QA/QC Requirements

For information on options for QA/QC requirements, please refer to the Technical Support Documents for general stationary fuel combustion (EPA-HQ-OAR-2008-004), landfills (EPA-HQ-OAR-2008-034), and wastewater treatment (EPA-HQ-OAR-2008-035).

9. References

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